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different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

REMARKS

The Office Action dated May 8, 2003 has been carefully reviewed and the following remarks have been made in consequence thereof.

Claims 1-4, 6-14, 16-24, and 26-29 are pending in this application. Claims 1-29 stand rejected. Claims 5, 15, and 25 have been canceled.

The rejection of Claims 1 and 3-10 under 35 U.S.C. § 102 as being anticipated by Tamai et al. (U.S. Patent 6,512,359) is respectfully traversed.

Tamai et al. describe a current detector that includes a conductor to be measured 10 that includes a first branch path 12-1 and a second branch path 12-2 with a though hole 11 defined therethrough. A first Hall element 20 generates a voltage signal corresponding to a disturbance magnetic flux density. A second Hall element 21 generates a voltage signal corresponding to a combination of magnetic flux densities due to current flowing in each branch path 12-1 and 12-2 and to disturbance magnetic flux density. A voltage signal including a disturbance voltage signal from first Hall element 20 and a disturbance voltage signal from the second Hall element 21 is input to a correction portion 40. The correction portion 40 outputs a voltage signal S obtained by subtracting the disturbance voltage signal from the first Hall element 20 from the voltage signal including the disturbance voltage signal from the second Hall element 21. Accordingly, the voltage signal output from the correction portion 40 reflects the magnitude of the current I flowing through the conductor to be measured 10.

Claim 1 recites a current sensor for an apparatus wherein the current sensor includes "a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field having a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output."

Tamai et al. does not describe nor suggest a current sensor for an apparatus wherein the current sensor includes a conductor including a slit and a plurality of Hall effect devices

inserted at least partially within the slit wherein the conductor is configured to generate a magnetic field having a pre-determined shape wherein the Hall effect device is configured to detect the pre-determined shape and generate an output. Specifically, Tamai et al. does not describe nor suggest a current sensor including a conductor including a slit and a plurality of Hall effect devices inserted at least partially within the slit wherein the conductor is configured to generate a magnetic field having a pre-determined shape wherein each Hall effect device is configured to detect the pre-determined shape and generate an output. Rather, Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor located within a slot and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density located external to the slot wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor. Applicants respectfully submit that Tamai et al. teaches away from the present invention, and accordingly, Claim 1 is submitted to be patentable over Tamai et al.

Claims 3, 4, and 6-9 depend from independent Claim 1. When the recitations of Claims 3, 4, and 6-9 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 3, 4, and 6-9 likewise are patentable over Tamai et al.

Claim 10 recites a current sensor for an apparatus including “a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.”

Tamai et al. does not describe nor suggest a current sensor for an apparatus including a slit and a plurality of Hall effect devices inserted at least partially within the slit, the conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from the first direction, and a pre-determined shape wherein each Hall effect device is configured to detect the pre-determined shape and generate an output. Specifically, Tamai et al. does not describe nor suggest a current sensor for an apparatus

including a slit and a plurality of Hall effect devices inserted at least partially within the slit nor a conductor that is configured to generate a magnetic field that includes a pre-determined shape wherein each Hall effect device is configured to detect the pre-determined shape and generate an output, but rather Tamai et al. a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor located within a conductor slot and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density located external to the conductor slot wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor. As such, Applicants respectfully submit that Tamai et al. teaches away from the present invention, and accordingly, Claim 10 is submitted to be patentable over Tamai et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 3-4 and 6-10 be withdrawn.

The rejection of Claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Tamai et al. (U.S. Patent No. 6,512,359) in view of Dames et al. (U.S. Patent No. 6,414,475) is respectfully traversed.

Tamai et al. is described above. Dames et al. describe a fiscal electricity meter that includes sensing coils to sense current flowing through conductors within the meter. Notably, at Col. 1, lines 27-30, Dames et al. recite that “[t]he use of a Hall sensor suffers from the disadvantage that Hall sensors can suffer from temperature dependence and are also relatively expensive.”

Applicants respectfully submit that the Section 103 rejection of the presently pending claims is not a proper rejection. As is well established, obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. Neither Dames et al., nor Tamai et al., considered alone or in combination, describe or suggest the claimed combination. Furthermore, in contrast to the assertion within the Office Action, Applicants respectfully submit that it would not be obvious to one skilled in the art to combine Dames et al. with Tamai et al. because there is no motivation to combine the references suggested in the art. Additionally, the Examiner has not pointed to any prior art that teaches or suggests to combine the disclosures, other than Applicants' own teaching. Rather, only the conclusory

statement that “[i]t would have been an obvious to one having an ordinary skill in the art at the time the invention was made to modify the current sensor of Tamai et al. and use within the electricity meter of Dames et al. for the purpose of sensing different current in different power line” suggests combining the disclosures.

As the Federal Circuit has recognized, obviousness is not established merely by combining references having different individual elements of pending claims. Ex parte Levingood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. Rather, there must be some suggestion, outside of Applicants’ disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicant’s disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the prior art disclosures, nor any reasonable expectation of success has been shown.

Furthermore, it is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the cited art so that the claimed invention is rendered obvious. Specifically, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the art to deprecate the claimed invention. Further, it is impermissible to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The present Section 103 rejection is based on a combination of teachings selected from multiple patents in an attempt to arrive at the claimed invention. Specifically, Tamai et al. are cited for their teaching of a current sensor that includes a first element that detects a disturbance magnetic field originating external to the current sensor and a second element that detects a plurality of magnetic fields due to current flowing within the current sensor and subtracting the signals from the first and second elements to generate a current output, and Dames et al. are cited only for their teaching of wound current transformers in electric meters. Since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejection of Claim 2 be withdrawn.

Further, and to the extent understood, neither of Tamai et al. nor Dames et al., considered alone or in combination, describe or suggest the claimed combination, and as such, the presently pending claims are patentably distinguishable from the cited combination. Specifically, Claim 2 depends from Claim 1 which recites a current sensor for an apparatus wherein the current sensor includes “a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field having a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.”

Neither Tamai et al. nor Dames et al. alone or in combination describe or suggest a current sensor for an apparatus wherein the current sensor includes a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within the slit wherein the conductor is configured to generate a magnetic field having a pre-determined shape wherein the Hall effect device is configured to detect the pre-determined shape and generate an output. Specifically, neither Tamai et al. nor Dames et al. alone or in combination describe or suggest a current sensor wherein the conductor is configured to generate a magnetic field having a pre-determined shape wherein the Hall effect device is configured to detect the pre-determined shape and generate an output. Rather, Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor, and Dames et al. describe an electricity meter that uses coils to sense and transform current in a meter conductor and states that “[t]he use of a Hall sensor suffers from the disadvantage that Hall sensors can suffer from temperature dependence and are also relatively expensive.” Applicants respectfully submit that Dames et al. teach away from the present invention, and accordingly, Claim 1 is submitted to be patentable over Tamai et al. in view of Dames et al.

Claim 2 depends from independent Claim 1. When the recitations of Claim 2 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 2 likewise is patentable over Tamai et al. in view of Dames et al.

For the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claim 2 be withdrawn.

The rejection of Claims 11-29 under 35 U.S.C. § 103(a) as being unpatentable over Plis et al. (U.S. Patent No. 5,854,995) in view of Tamai et al. (U.S. Patent No. 6,512,359) is respectfully traversed.

Tamai et al. is described above. Plis et al. describe an electricity meters and metering methods for vector metering of electricity which sense line voltage and line current signals on the power line, convert the sensed signals into a digital signal, and compute vector metering quantities for the power line over a determined interval of orthogonality for the sensed line voltages and line currents. Vector computing means for computing vector metering quantities is implemented using a digital signal processor working in combination with a general-purpose microprocessor, integrated within an electricity meter.

Applicants respectfully submit that the Section 103 rejection of the presently pending claims is not a proper rejection. As is well established, obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. Neither Plis et al., nor Tamai et al., considered alone or in combination, describe or suggest the claimed combination. Furthermore, in contrast to the assertion within the Office Action, Applicants respectfully submit that it would not be obvious to one skilled in the art to combine Plis et al. with Tamai et al. because there is no motivation to combine the references suggested in the art. Additionally, the Examiner has not pointed to any prior art that teaches or suggests to combine the disclosures, other than Applicants' own teaching. Rather, only the conclusory statement that “[i]t would have been an obvious to one having an ordinary skill in the art at the time the invention was made to modify Plis et al.'s electricity meter current sensor and using the current sensor of Tamai et al. for the purpose of sensing different current in a power line.” suggests combining the disclosures.

As the Federal Circuit has recognized, obviousness is not established merely by combining references having different individual elements of pending claims. Ex parte Levingood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. Rather, there must be some suggestion, outside of Applicants' disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicant's disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the prior art disclosures, nor any reasonable expectation of success has been shown.

Furthermore, it is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the cited art so that the claimed invention is rendered obvious. Specifically, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the art to deprecate the claimed invention. Further, it is impermissible to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The present Section 103 rejection is based on a combination of teachings selected from multiple patents in an attempt to arrive at the claimed invention. Specifically, Plis et al. are cited for their teaching of only an electricity meter that includes a voltage sensor and a current sensor and Tamai et al. are cited for their teaching of a current sensor that includes a first element that detects a disturbance magnetic field originating external to the current sensor and a second element that detects a plurality of magnetic fields due to current flowing within the current sensor and subtracting the signals from the first and second elements to generate a current output. Since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejection of Claims 11-29 be withdrawn.

Further, and to the extent understood, neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest the claimed combination, and as such, the presently pending claims are patentably distinguishable from the cited combination. Specifically, Claim 11 recites a residential electricity meter including "a voltage sensor and a current sensor, said current sensor comprising a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field having a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output."

Neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a residential electricity meter including a voltage sensor and a current sensor wherein the current sensor includes a conductor that includes a slit and a plurality of Hall effect devices inserted at least partially within the slit, the conductor is configured to generate a magnetic field having a pre-determined shape, the Hall effect device is configured to detect

the pre-determined shape and generate an output. Specifically, neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a residential electricity meter including a current sensor that includes a conductor that is configured to generate a magnetic field having a pre-determined shape and a plurality of Hall effect devices located within the conductor slit and are configured to detect the pre-determined shape and generate an output. Rather, in contrast to the present invention, Plis et al. describe an electricity metering methods for vector metering of electricity which sense line voltage and line current signals on the power line, convert the sensed signals into a digital signal, and compute vector metering quantities for the power line over a determined interval of orthogonality for the sensed line voltages and line currents, and Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor. For at least the reasons set forth above, Claim 11 is submitted to be patentable over Plis et al. in view of Tamai et al.

Claims 12-14 and 16-19 depend from independent Claim 11. When the recitations of Claims 12-14 and 16-19 are considered in combination with the recitations of Claim 11, Applicants submit that dependent Claims 12-14 and 16-19 likewise are patentable over Plis et al. in view of Tamai et al.

Claim 20 recites a residential electricity meter including “a voltage sensor and a current sensor, said current sensor comprising a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.”

Neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a residential electricity meter including a voltage sensor and a current sensor wherein the current sensor includes a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within the slit, the conductor is configured to generate a magnetic field that includes at least a first magnetic field component having a first direction and a

second magnetic field component having a second direction different from the first direction, and a pre-determined shape, the Hall effect device configured to detect the pre-determined shape and generate an output. Specifically, neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a residential electricity meter including a current sensor that includes a conductor that is configured to generate a magnetic field having a pre-determined shape and a plurality of Hall effect devices located within the conductor slit and that are configured to detect the pre-determined shape and generate an output. Rather, in contrast to the present invention, Plis et al. describe an electricity metering methods for vector metering of electricity which sense line voltage and line current signals on the power line, convert the sensed signals into a digital signal, and compute vector metering quantities for the power line over a determined interval of orthogonality for the sensed line voltages and line currents and Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor. For at least the reasons set forth above, Claim 20 is submitted to be patentable over Plis et al. in view of Tamai et al.

Claim 21 recites a method for sensing voltage and current in a residence wherein the method includes “providing an electricity meter comprising...a voltage sensor...a current sensor, wherein the current sensor includes a conductor that includes a slit and a plurality of Hall effect devices inserted at least partially within the slit, wherein the conductor is configured to generate a magnetic field having a pre-determined shape, and the Hall effect device is configured to detect the pre-determined shape and generate an output.”

Neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a method for sensing voltage and current in a residence wherein the method includes providing an electricity meter that includes, a voltage sensor, and a current sensor, wherein the current sensor includes a conductor that includes a slit and a plurality of Hall effect devices inserted at least partially within the slit, wherein the conductor is configured to generate a magnetic field having a pre-determined shape, and the Hall effect device is configured to detect the pre-determined shape and generate an output. Specifically, neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a method

for sensing voltage and current in a residence wherein the method includes providing an electricity meter that includes a current sensor that includes a conductor that is configured to generate a magnetic field having a pre-determined shape and a plurality of Hall effect devices located within the conductor slit and configured to detect the pre-determined shape and generate an output. Rather, in contrast to the present invention, Plis et al. describe electricity metering methods for vector metering of electricity which sense line voltage and line current signals on the power line, convert the sensed signals into a digital signal, and compute vector metering quantities for the power line over a determined interval of orthogonality for the sensed line voltages and line currents and Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor, but neither Plis et al. nor Tamai et al. describe or suggest a conductor that is configured to generate a magnetic field having a pre-determined shape and a Hall effect device is configured to detect the pre-determined shape and generate an output. For at least the reasons set forth above, Claim 21 is submitted to be patentable over Plis et al. in view of Tamai et al.

Claims 22-24 and 26-28 depend from independent Claim 21. When the recitations of Claims 22-24 and 26-28 are considered in combination with the recitations of Claim 21, Applicants submit that dependent Claims 22-24 and 26-28 likewise are patentable over Plis et al. in view of Tamai et al.

Claim 29 recites a method for sensing voltage and current in a residence wherein the method includes “providing a residential electricity meter comprising...a voltage sensor...a current sensor, said current sensor comprising a conductor comprising a slit and a plurality of Hall effect devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.”

Neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a method for sensing voltage and current in a residence wherein the method includes

providing a residential electricity meter that includes a voltage sensor, and a current sensor wherein the current sensor includes a conductor that includes a slit and a plurality of Hall effect devices inserted at least partially within the slit, the conductor is configured to generate a magnetic field that includes at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from the first direction, and a pre-determined shape, the Hall effect device is configured to detect the pre-determined shape and generate an output. Specifically, neither Plis et al. nor Tamai et al., considered alone or in combination, describe or suggest a residential electricity meter including a current sensor that includes a conductor that is configured to generate a magnetic field having a pre-determined shape and a plurality of Hall effect devices located within the conductor slit that are configured to detect the pre-determined shape and generate an output. Rather, in contrast to the present invention, Plis et al. describe an electricity metering methods for vector metering of electricity which sense line voltage and line current signals on the power line, convert the sensed signals into a digital signal, and compute vector metering quantities for the power line over a determined interval of orthogonality for the sensed line voltages and line currents and Tamai et al. describe a current sensor that includes a first element to detect disturbance magnetic flux density originating external to the current sensor and a second element that detects magnetic flux density due to current flowing in a conductor of interest and disturbance magnetic flux density wherein the signal due to the disturbance is subtracted from the signal due to the disturbance and the current flowing in the conductor. For at least the reasons set forth above, Claim 29 is submitted to be patentable over Plis et al. in view of Tamai et al.

For the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 11-29 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



William J. Zychlewicz
Registration No. 51,366
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070



RD-28,476
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Berkcan et al.

: Art Unit: 2829

Serial No.: 10/026,151

: Examiner: Nguyen, Jimmy

Filed: December 19, 2001

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For: RESIDENTIAL ELECTRICITY METER

:

SUBMISSION OF MARKED UP CLAIMS

Mail Stop NON-FEE AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith are marked up Claims in accordance with 37 C.F.R. Section 1.121(c)(1)(ii).

IN THE CLAIMS:

Please cancel claims 5, 15, and 25.

1. (once amended) A current sensor for an apparatus, said current sensor comprising a conductor comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field having a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

10. (once amended) A current sensor for an apparatus comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

11. (once amended) A residential electricity meter comprising a voltage sensor and a current sensor, said current sensor comprising a conductor comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field having a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

20. (once amended) A residential electricity meter comprising a voltage sensor and a current sensor, said current sensor comprising a conductor comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within said slit, said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

21. (once amended) A method for sensing voltage and current in a residence, said method comprising:

providing an electricity meter comprising:

a voltage sensor; and

a current sensor, wherein the current sensor comprises a conductor comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within the slit, wherein the conductor is configured to generate a magnetic field having a pre-determined shape, and [the] each Hall effect device is configured to detect the pre-determined shape and generate an output.

29. (once amended) A method for sensing voltage and current in a residence, said method comprising:

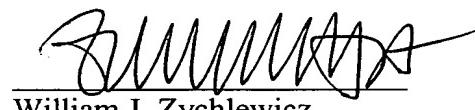
providing a residential electricity meter comprising:

a voltage sensor; and

a current sensor, said current sensor comprising a conductor comprising a slit and [at least one] a plurality of Hall effect [device] devices inserted at least partially within said slit,

said conductor is configured to generate a magnetic field comprising at least a first magnetic field component having a first direction and a second magnetic field component having a second direction different from said first direction, and a pre-determined shape, each said Hall effect device configured to detect said pre-determined shape and generate an output.

Respectfully Submitted,



William J. Zychlewicz
Registration No. 51,366
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070